Validation of OMPS LP v2: TH correction and time dependent variability

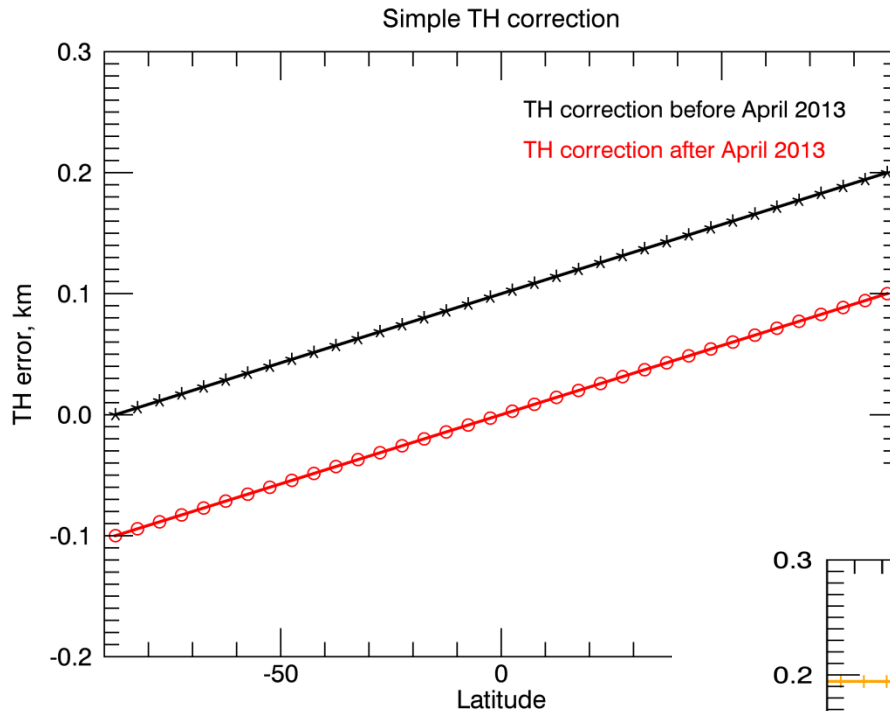Natalya Kramarova, P.K. Bhartia, Leslie Moy

Outline:

TH correction for version 2:

1. Do we see improvement due to latitudinal TH correction?
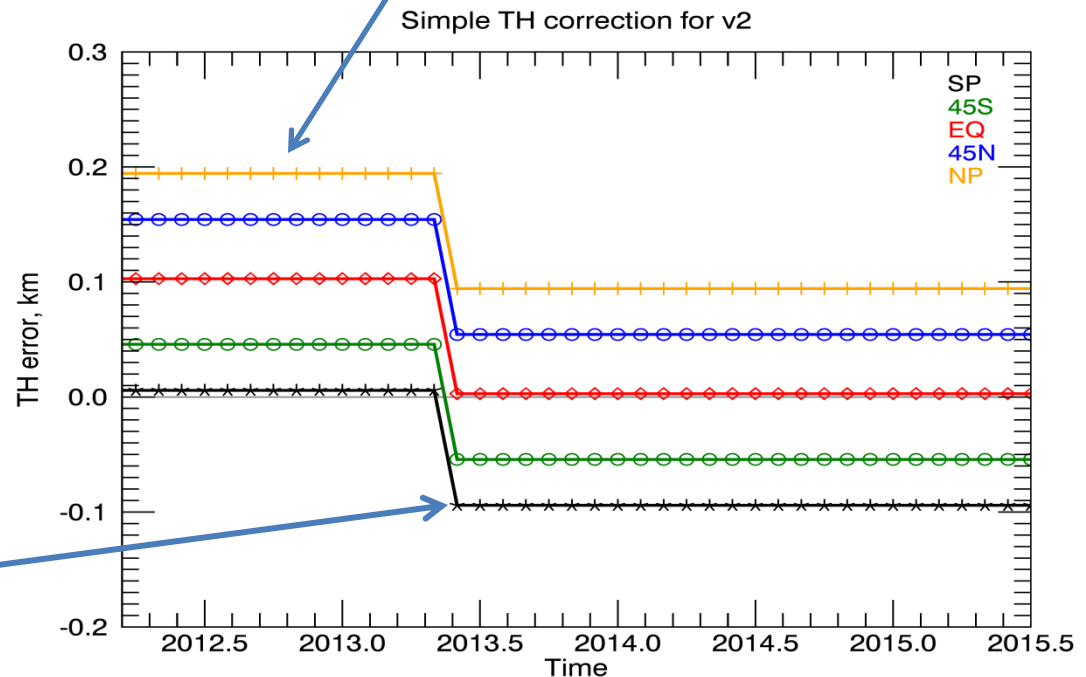2. Do we see evidence of 100m step in ozone data?

What have left after TH correction?

Simple TH correction

Simple TH correction

TH correction before April 2013
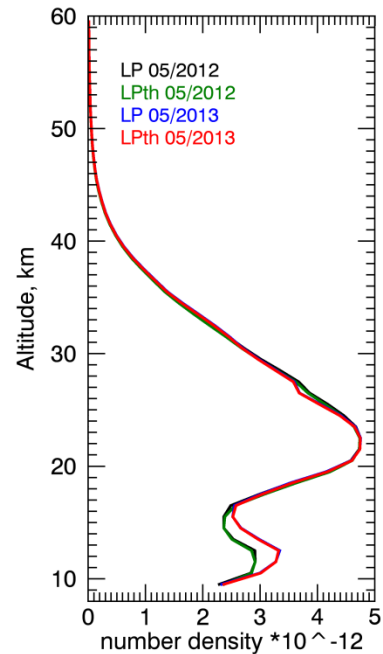TH correction after April 2013

Largest TH change for equatorial (100m) and northern latitudes (150-200m) occurs in period from April 2012-April 2013

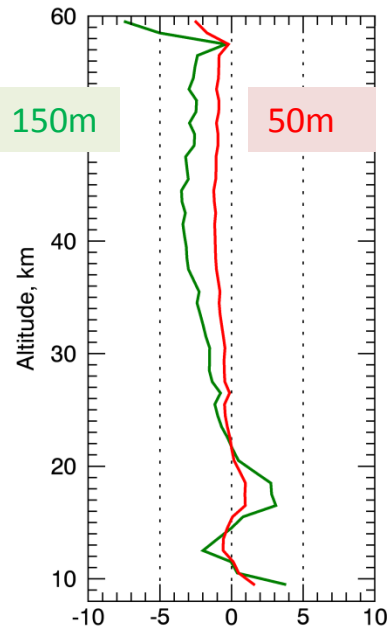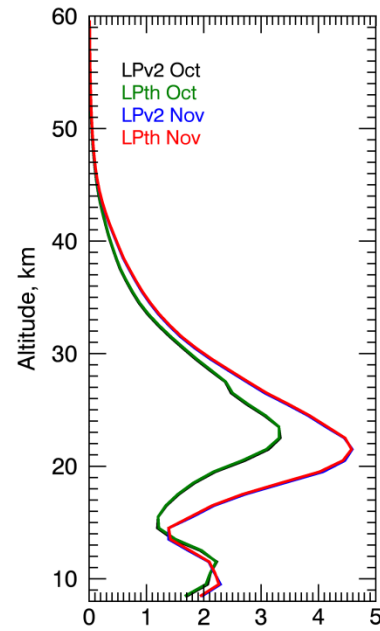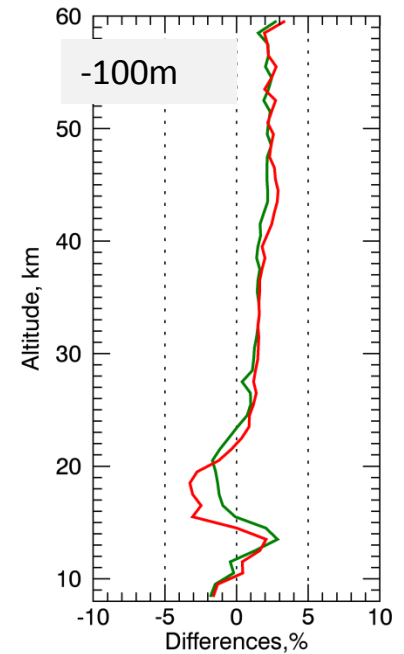For South Pole latitudes the largest change occurred after April 2013

Simple TH correction for v2

SP
45S
EQ
45N
NP

Sensitivity to TH correction

Mean ozone profiles, May 2012/2013, 47N

LP 05/2012
LPth 05/2012
LP 05/2013
LPth 05/2013

Differences

150m   50m

Mean ozone profiles, Oct-Nov 2013, 80S

LPv2 Oct
LPth Oct
LPv2 Nov
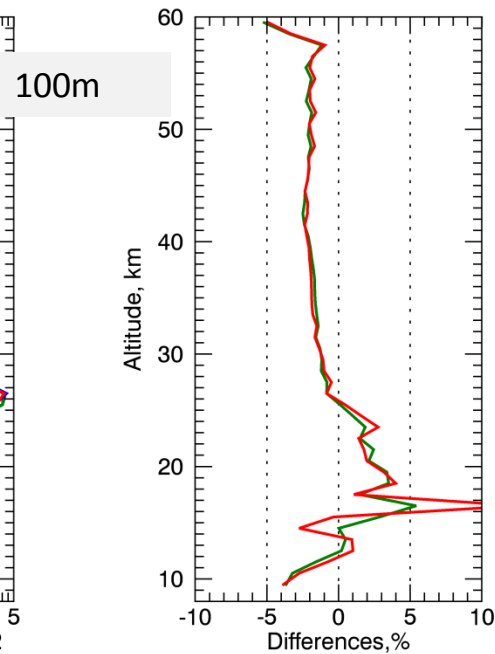LPth Nov

Differences

-100m

Mean ozone profiles, July&October 2012, EQ

LP Jul
LPth Jul
LP Oct
LPth Oct

100m

Differences

Biases relative to MLS before (solid lines) and after (dashed lines) TH correction
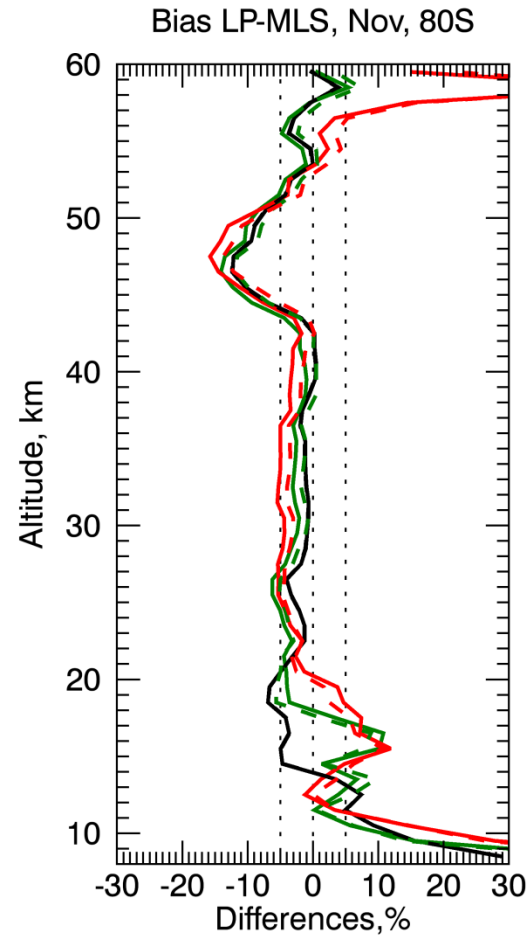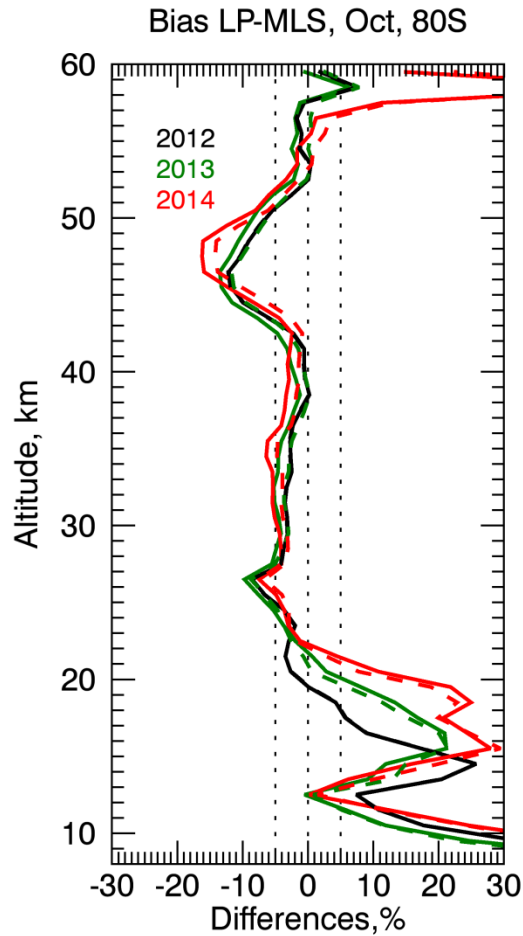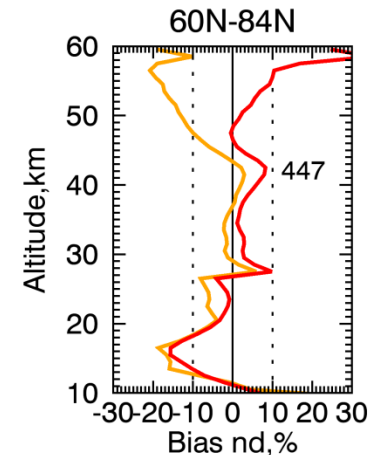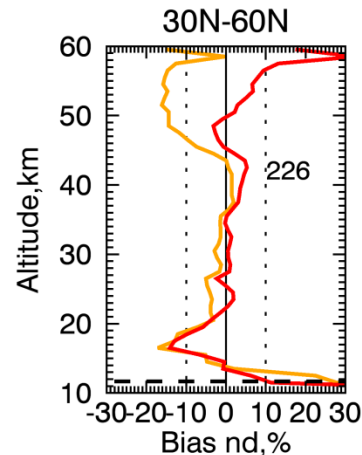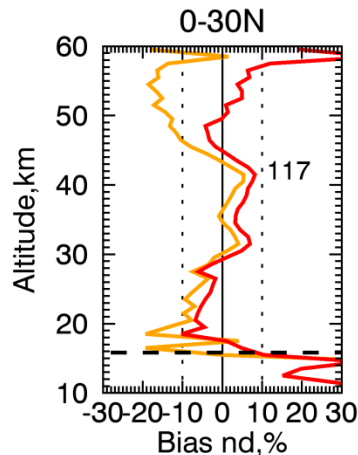
Biases between LP and MLS/ACE, April 2012 – March 2013
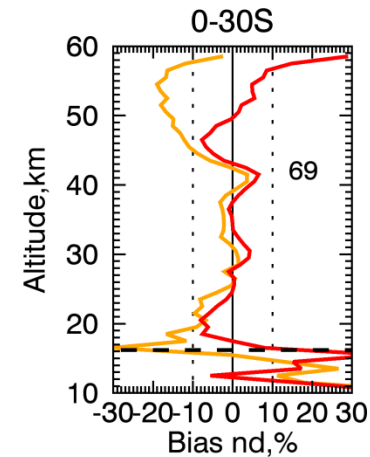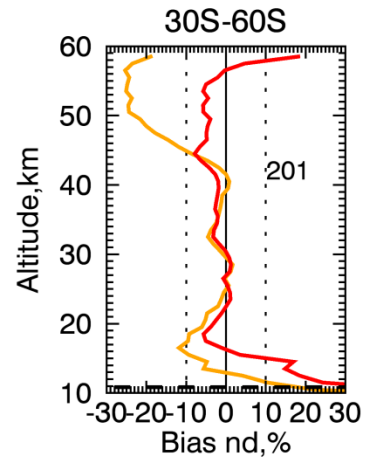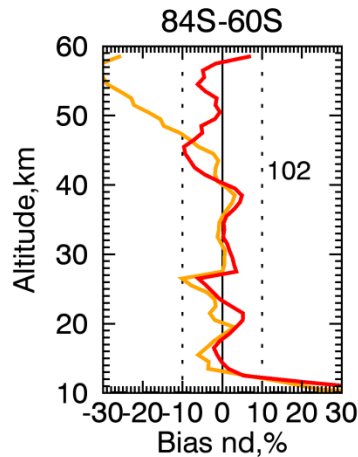
No TH corrections
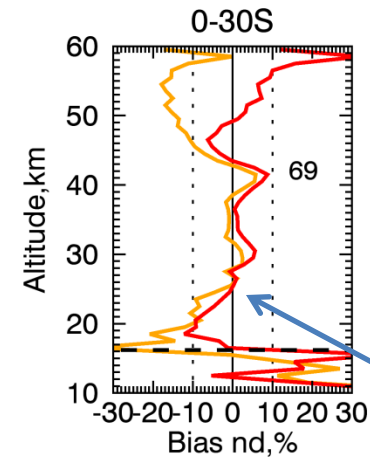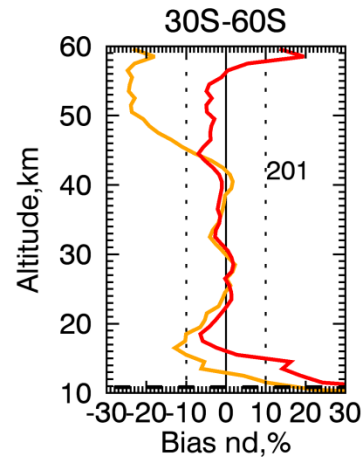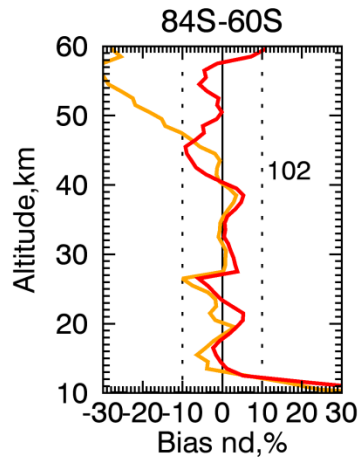
Aura MLS   ACE-FTS
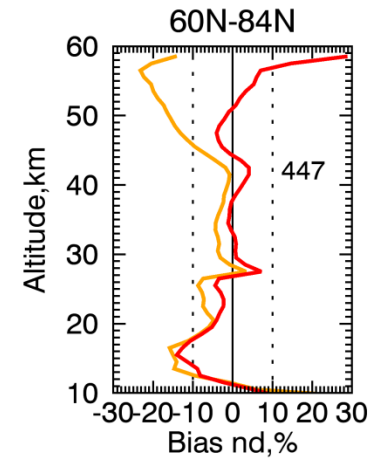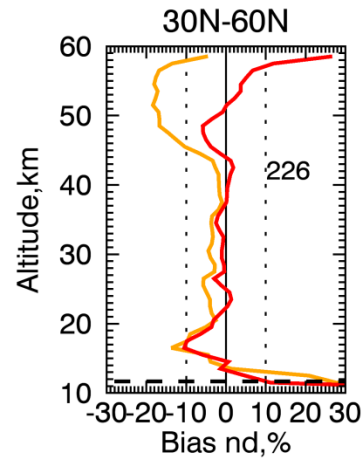
Note this slope in biases: indication of TH error

Biases between LP and MLS/ACE, April 2012 – March 2013

With TH corrections
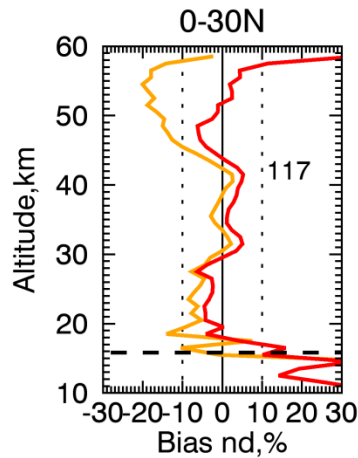
Visible improvement (slope decreases) everywhere between 60S and 82N

OMPS LP v2 against lidars

No TH correction

Central slit

This slope indicates possible TH error

OHP 297   MLO 122   HOH 169   TBL 81

OMPS LP v2 against lidars

Simple TH correction

Central slit

The slope reduced after TH corrections

OHP 297   MLO 122   HOH 169   TBL 81
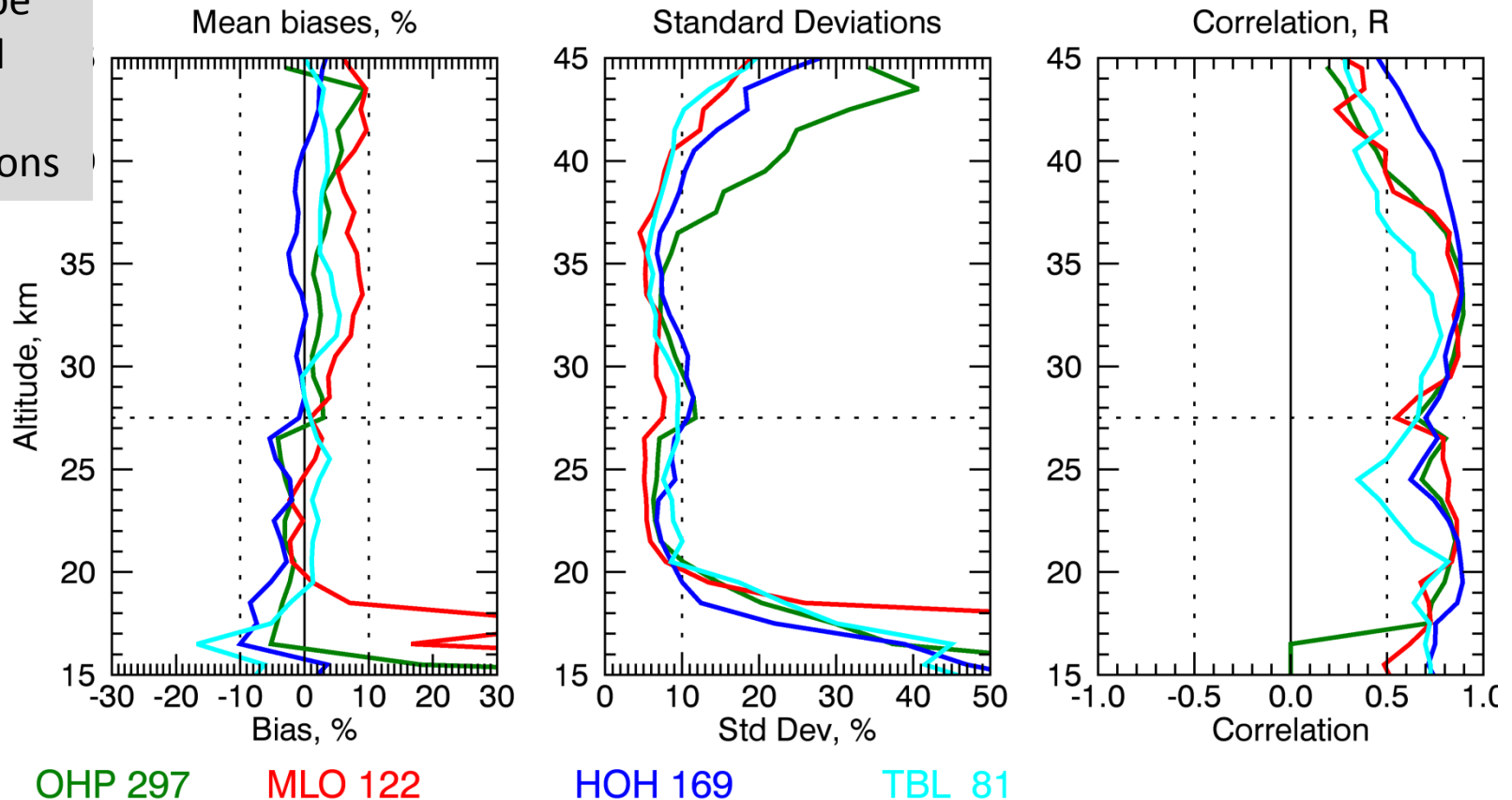
Drift between LP v2 and MLS

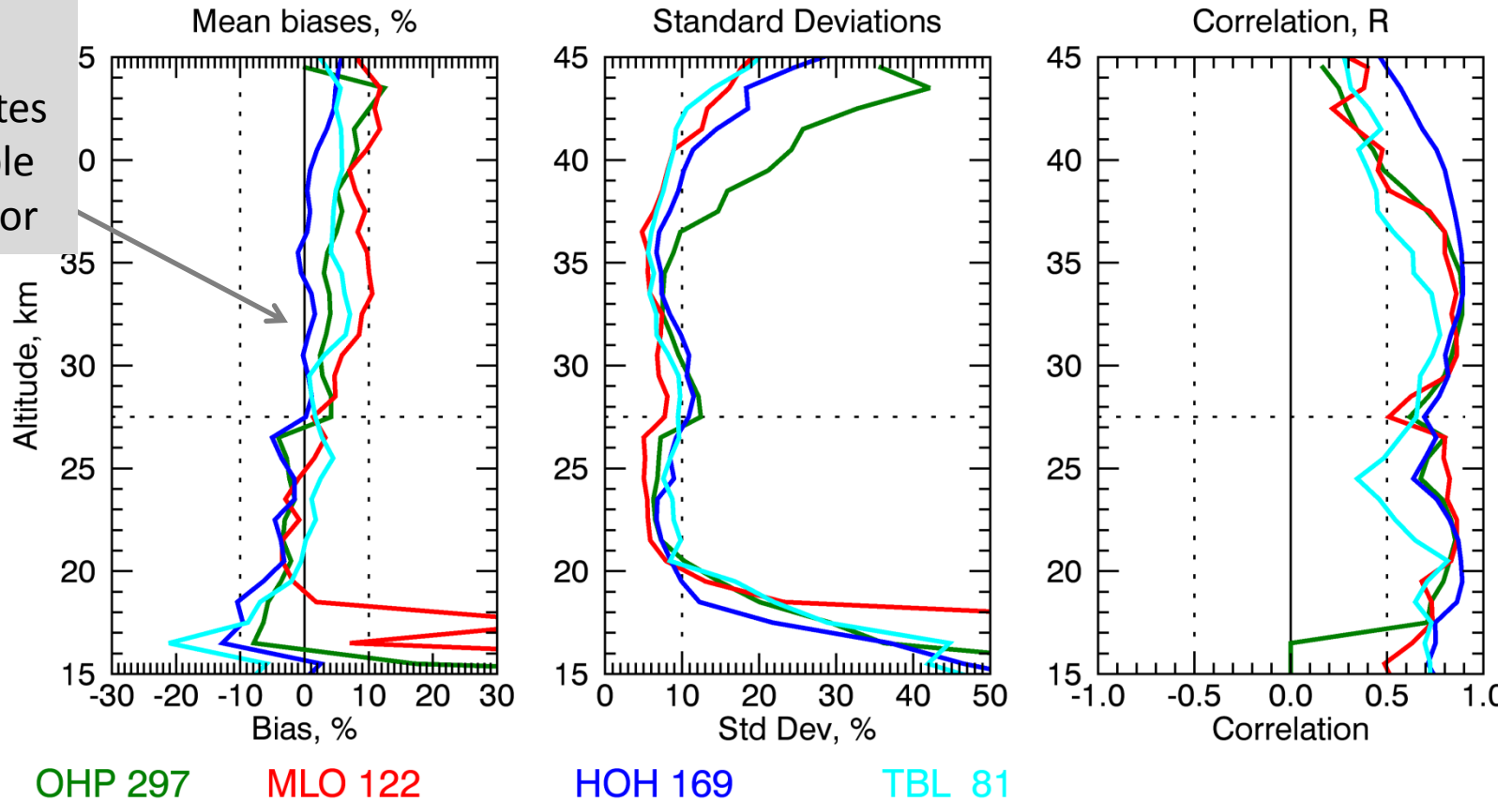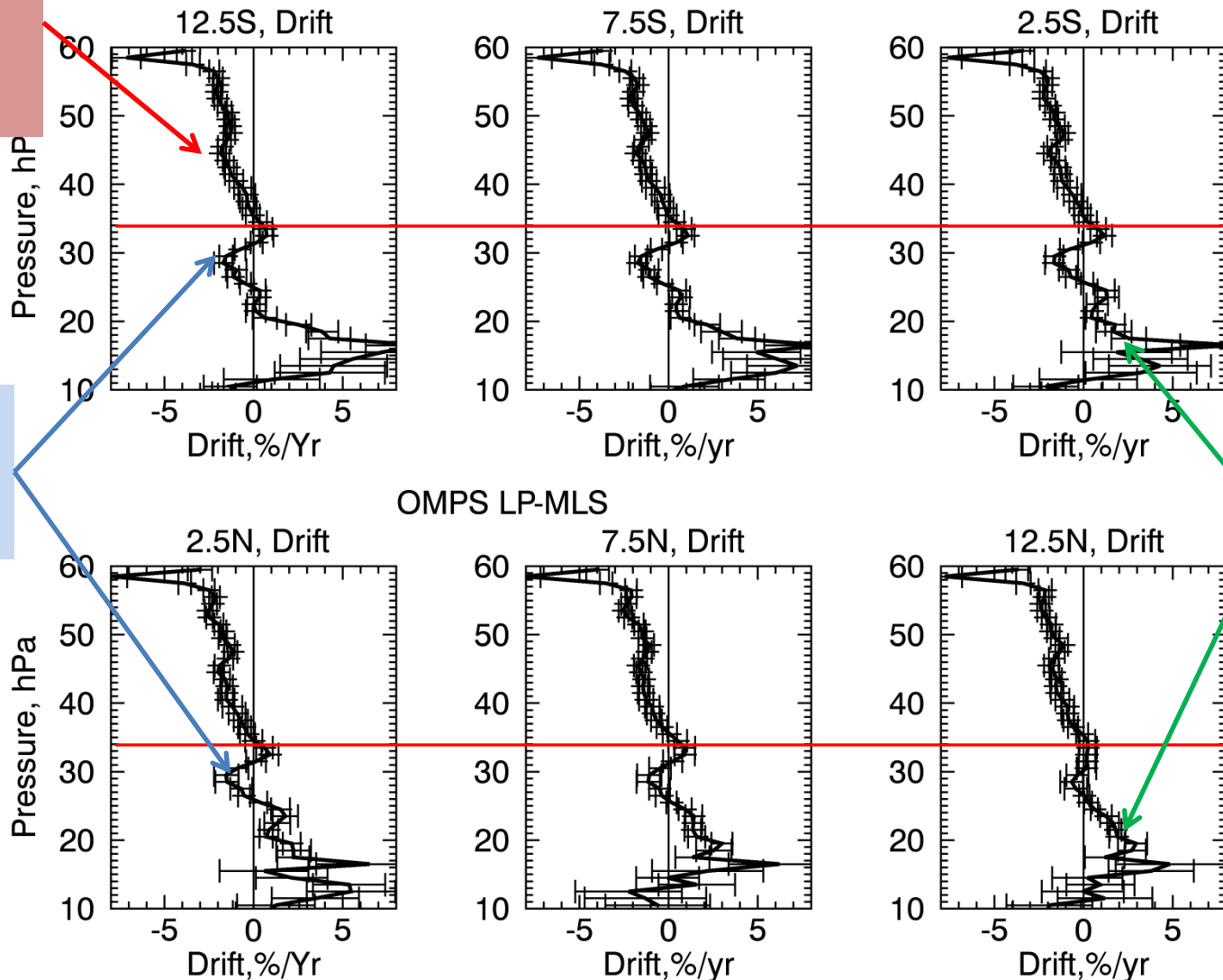There is a negative drift above 35 km

At ~35 km drift between LP and MLS close to 0

Negative drift around 30 km;
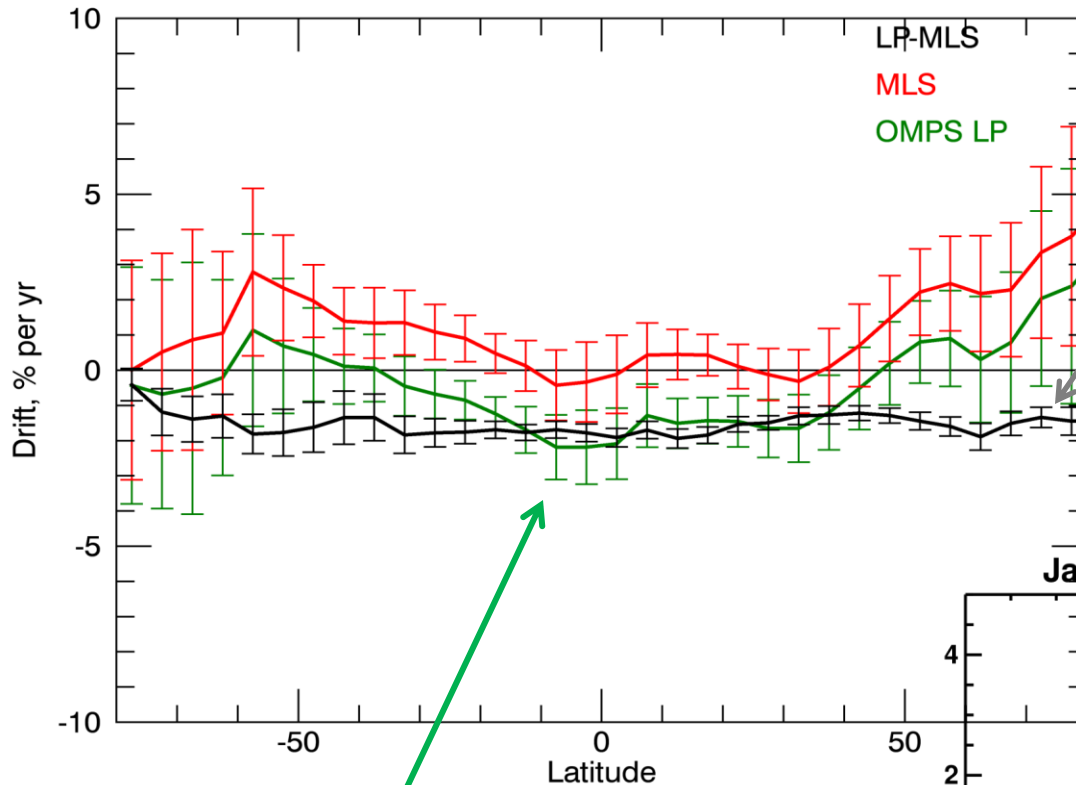
Below 25 km drift is mostly positive

35 km

12.5S, Drift 7.5S, Drift 2.5S, Drift

OMPS LP-MLS

2.5N, Drift 7.5N, Drift 12.5N, Drift

Drift between LP v2 and MLS

Ozone number density @45km

LP-MLS
MLS
OMPS LP

Drifts do no depend on latitude above 35 km

Jan 2012-Dec 2015 MLS/N19 Anomaly Drift

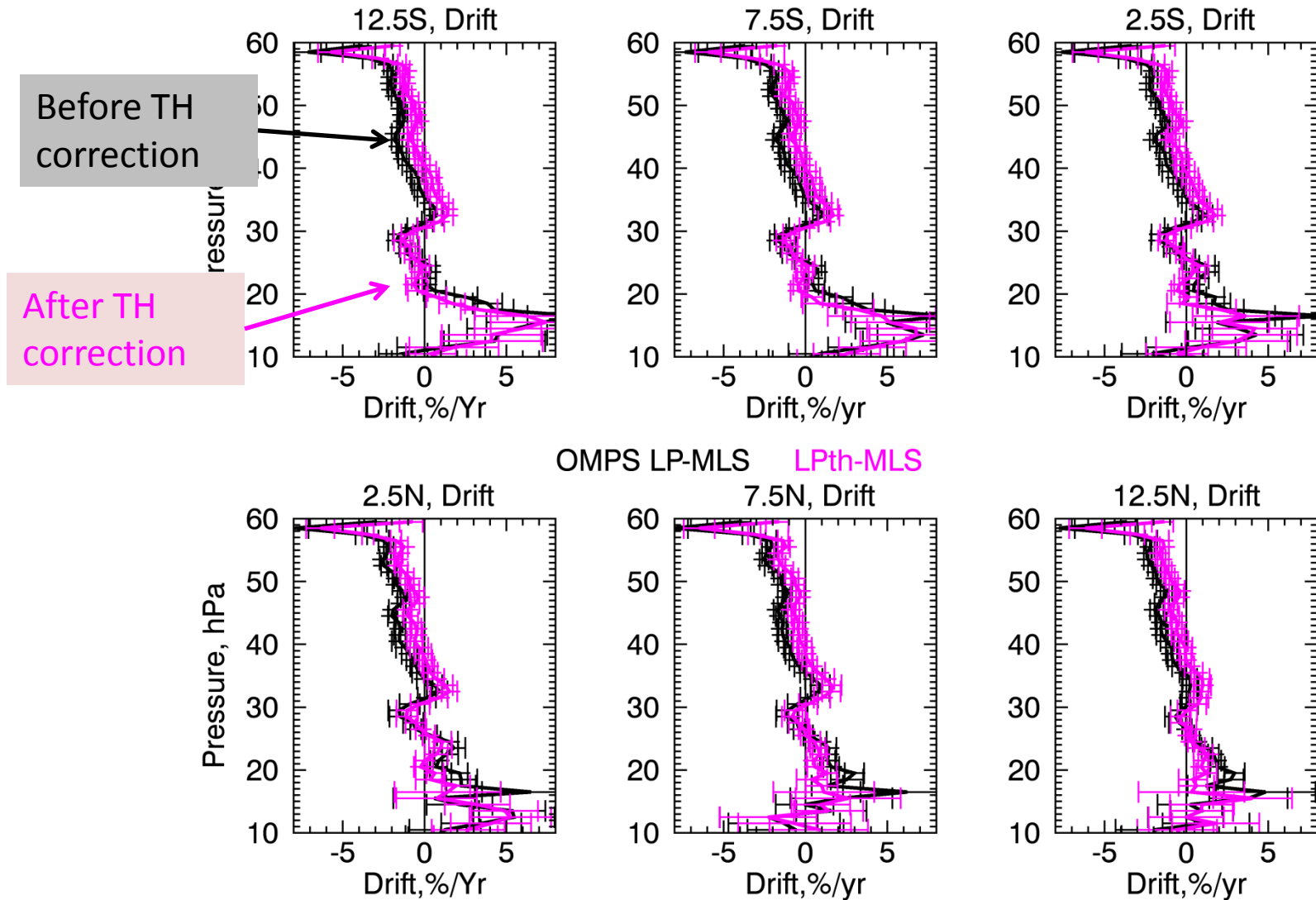At 1 hPa drift between SBUV and MLS << 1%

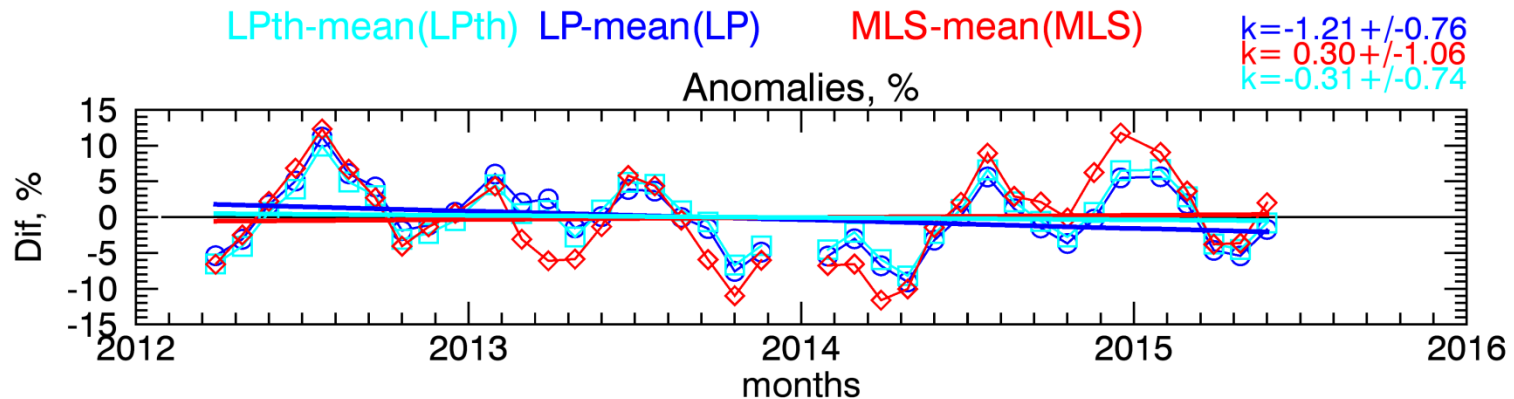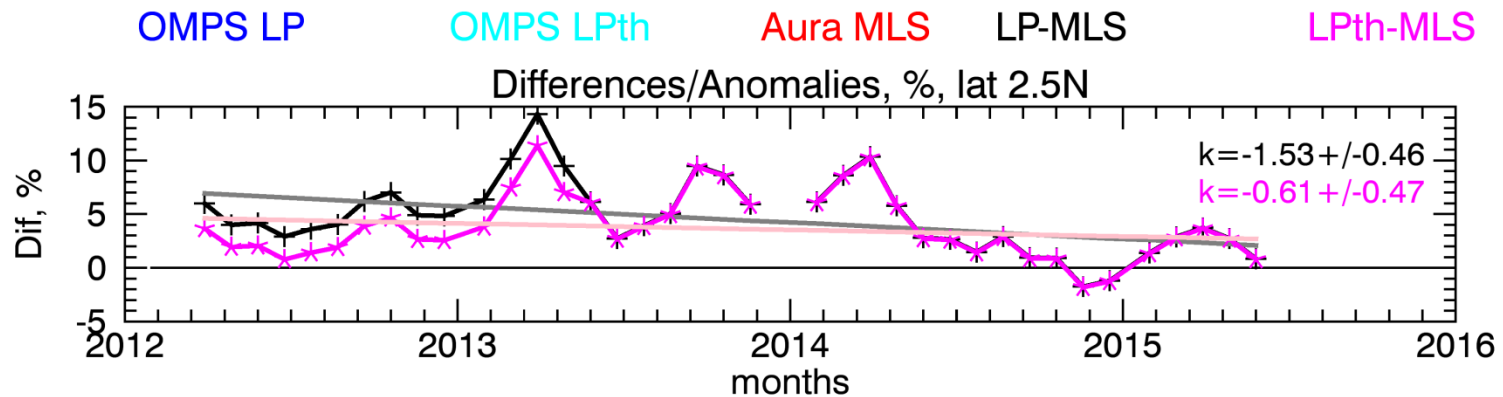Trends derived from LP and MLS have clear latitudinal structures, which are similar for both instruments
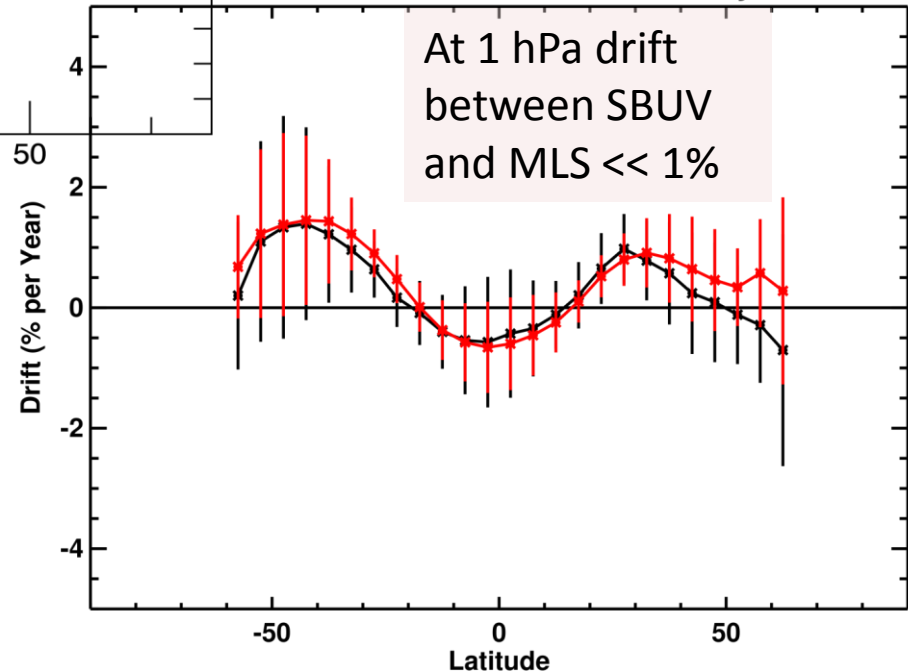
Does the TH correction helps to reduce drifts?

Before TH correction

After TH correction

Is the linear fit a good tool to determine drifts ?
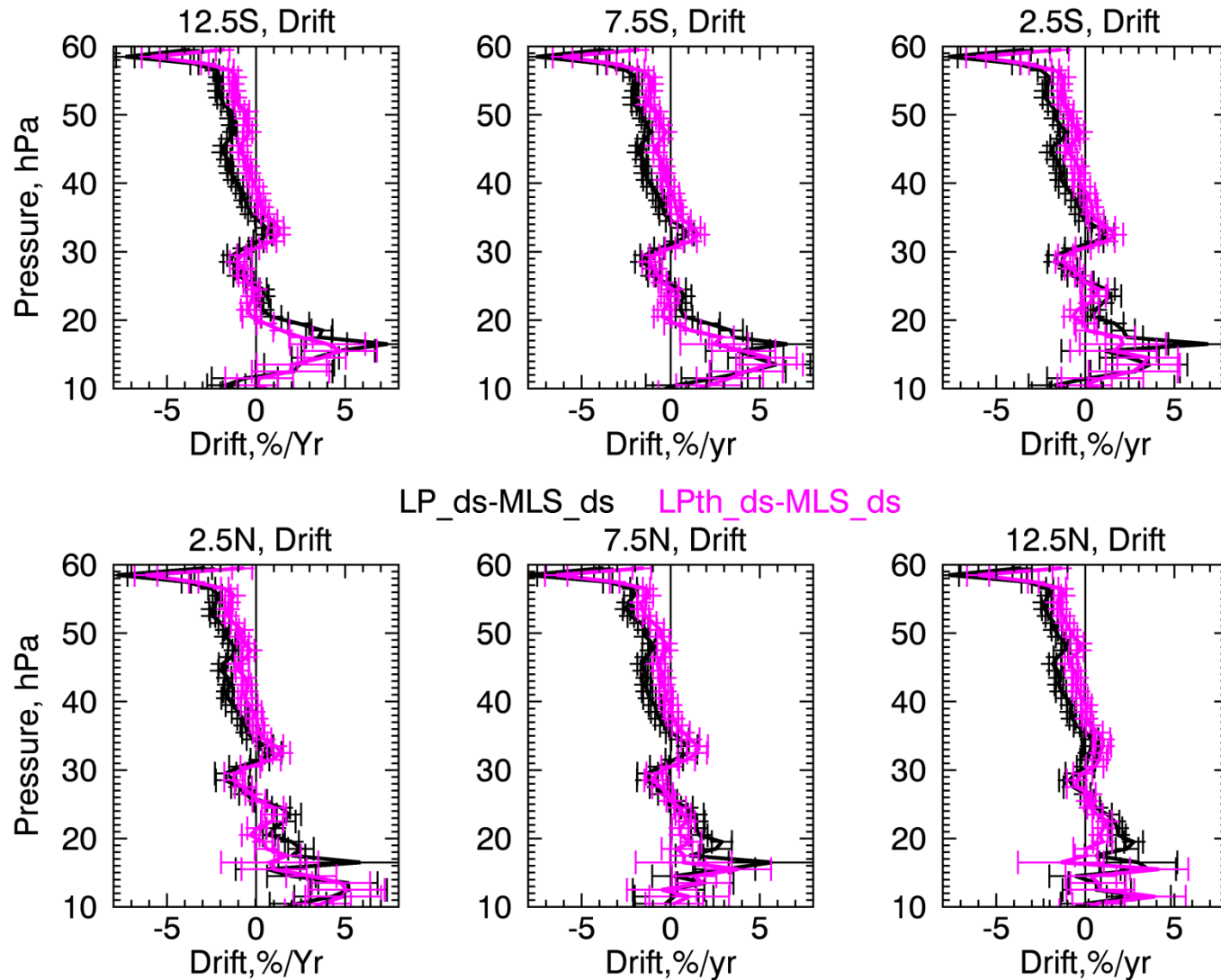
Time series of LP and MLS @ 40 km, Tropics
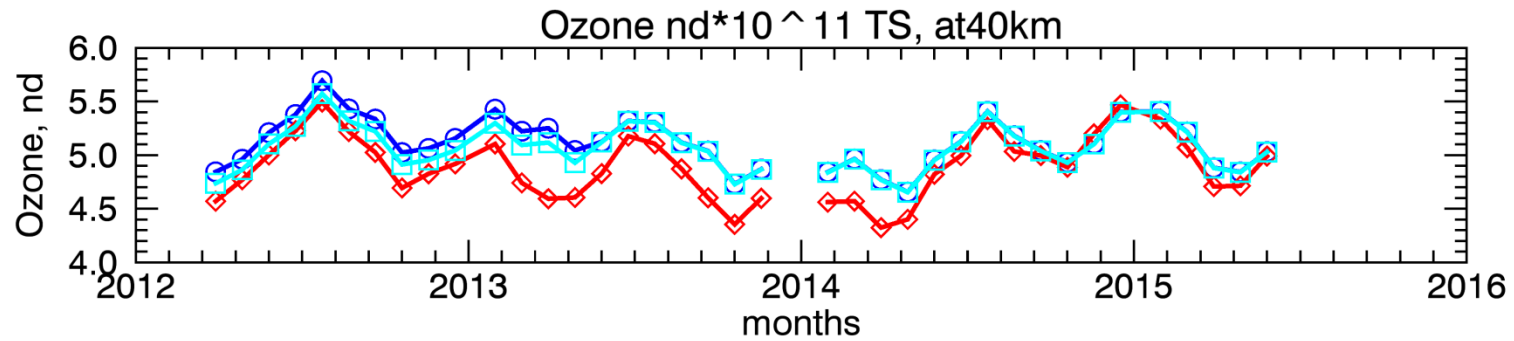
Time series of LP and MLS @ 40 km, NH
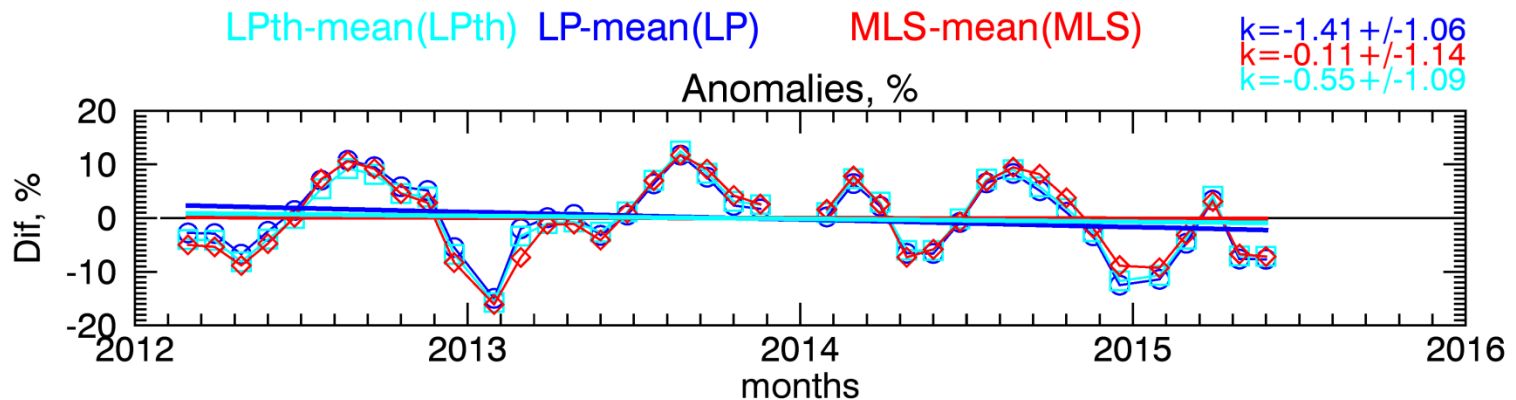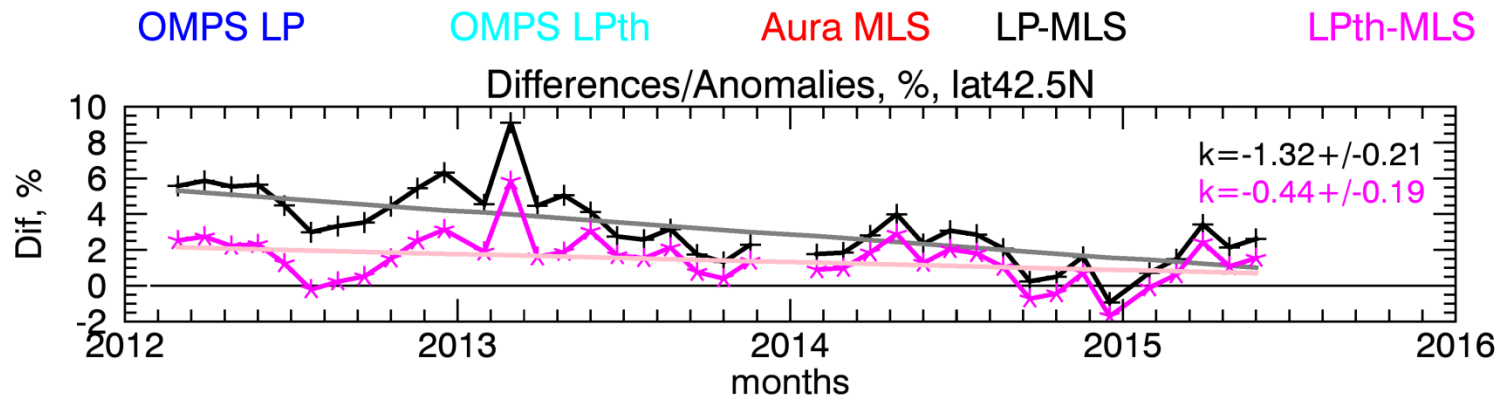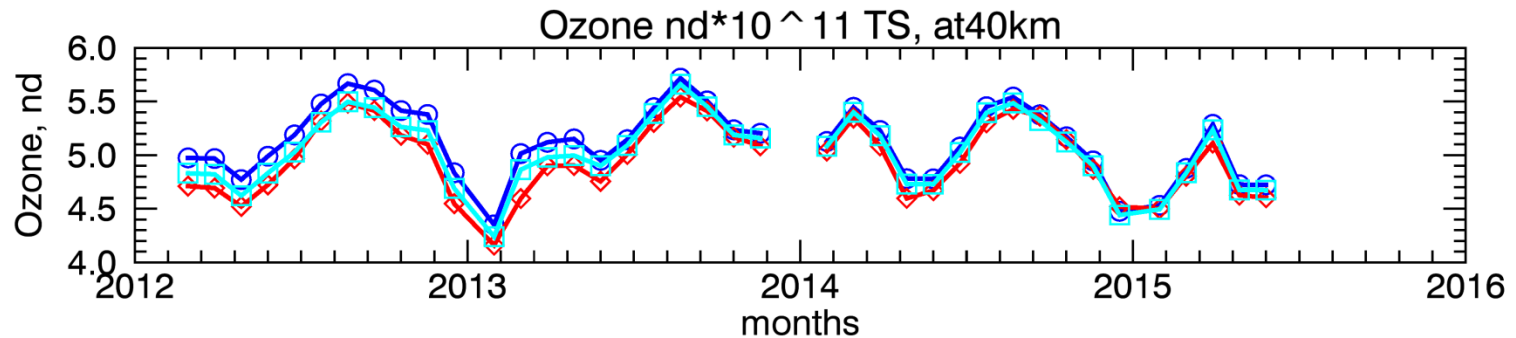
Ozone nd*10^11 TS, at40km

OMPS LP   OMPS LPth   Aura MLS   LP-MLS   LPth-MLS

Differences/Anomalies, %, lat42.5N

k=-1.32+/-0.21
k=-0.44+/-0.19

LPth-mean(LPth)   LP-mean(LP)   MLS-mean(MLS)   k=-1.41+/-1.06
k=-0.11+/-1.14
k=-0.55+/-1.09

Anomalies, %

Time series of LP and MLS @ 40 km, SH

Ozone nd*10^11 TS, at40km
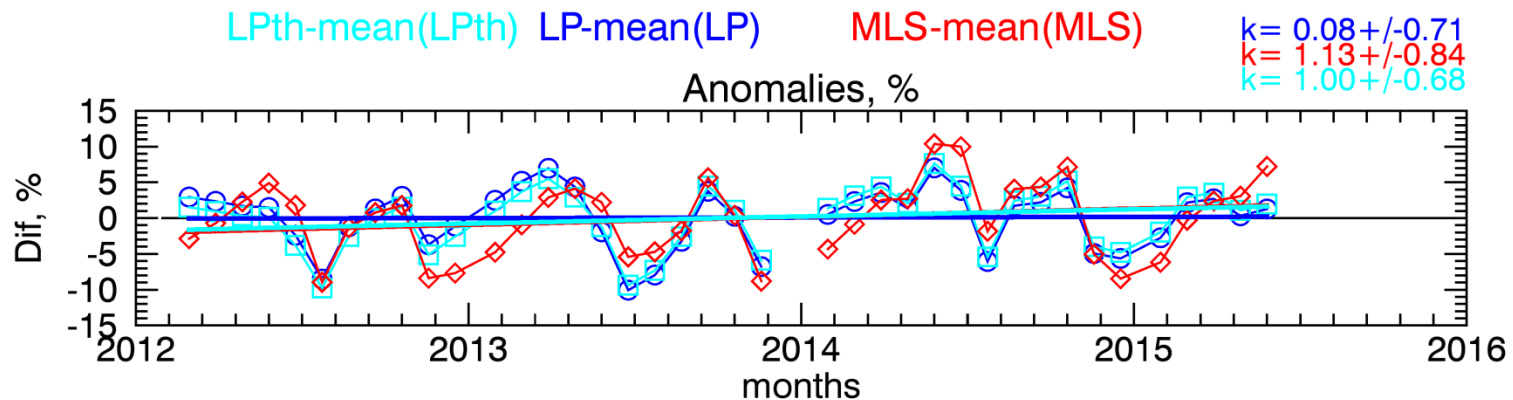
OMPS LP   OMPS LPth   Aura MLS   LP-MLS   LPth-MLS

Differences LP-MLS, %, lat42.5S

k=-1.05+/-0.58
k=-0.14+/-0.55

LPth-mean(LPth) LP-mean(LP)   MLS-mean(MLS)

k= 0.08+/-0.71
k= 1.13+/-0.84
k= 1.00+/-0.68

Anomalies, %
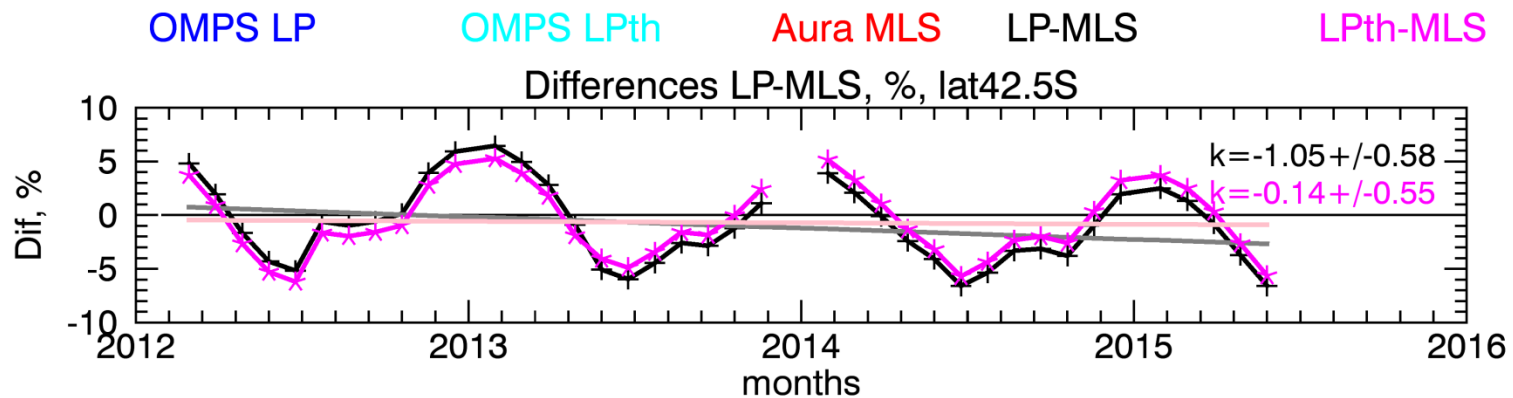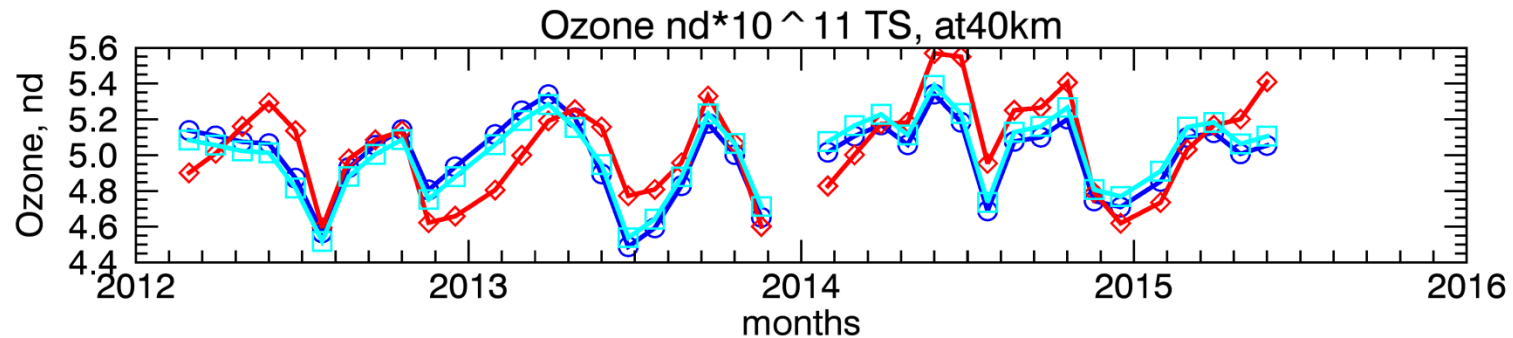
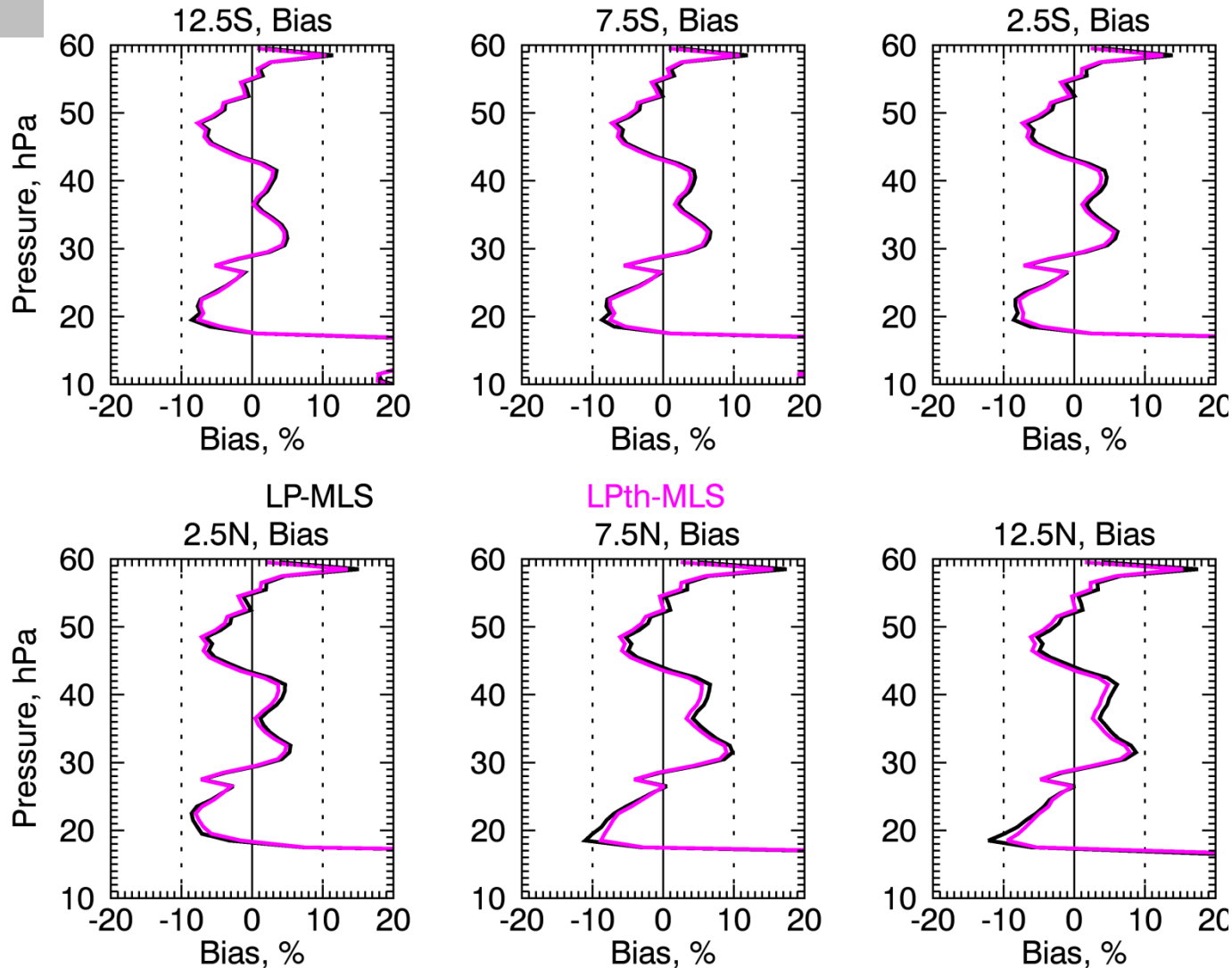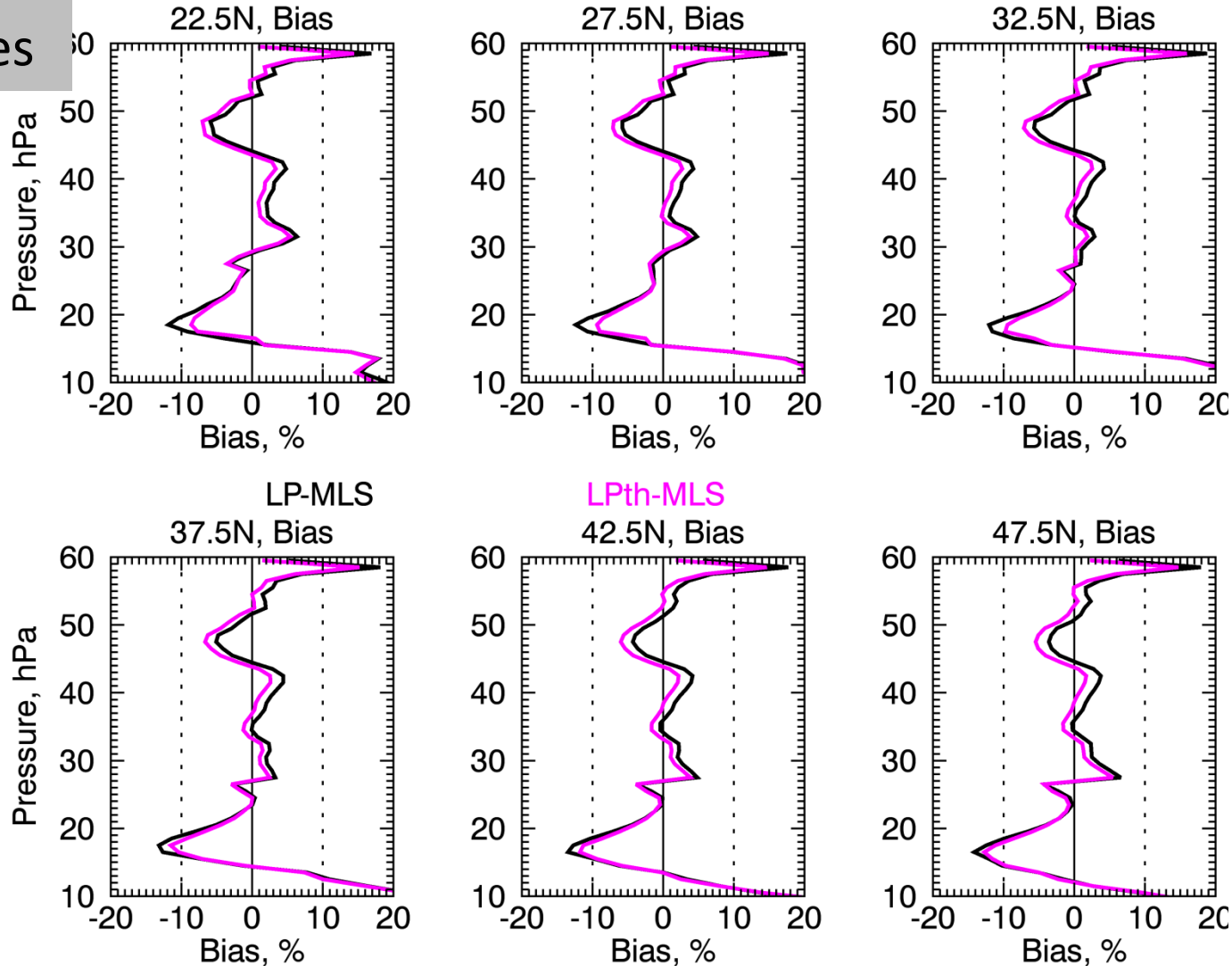# Does TH correction change the structure of LP-MLS biases over the entire 3-year period?

Tropics

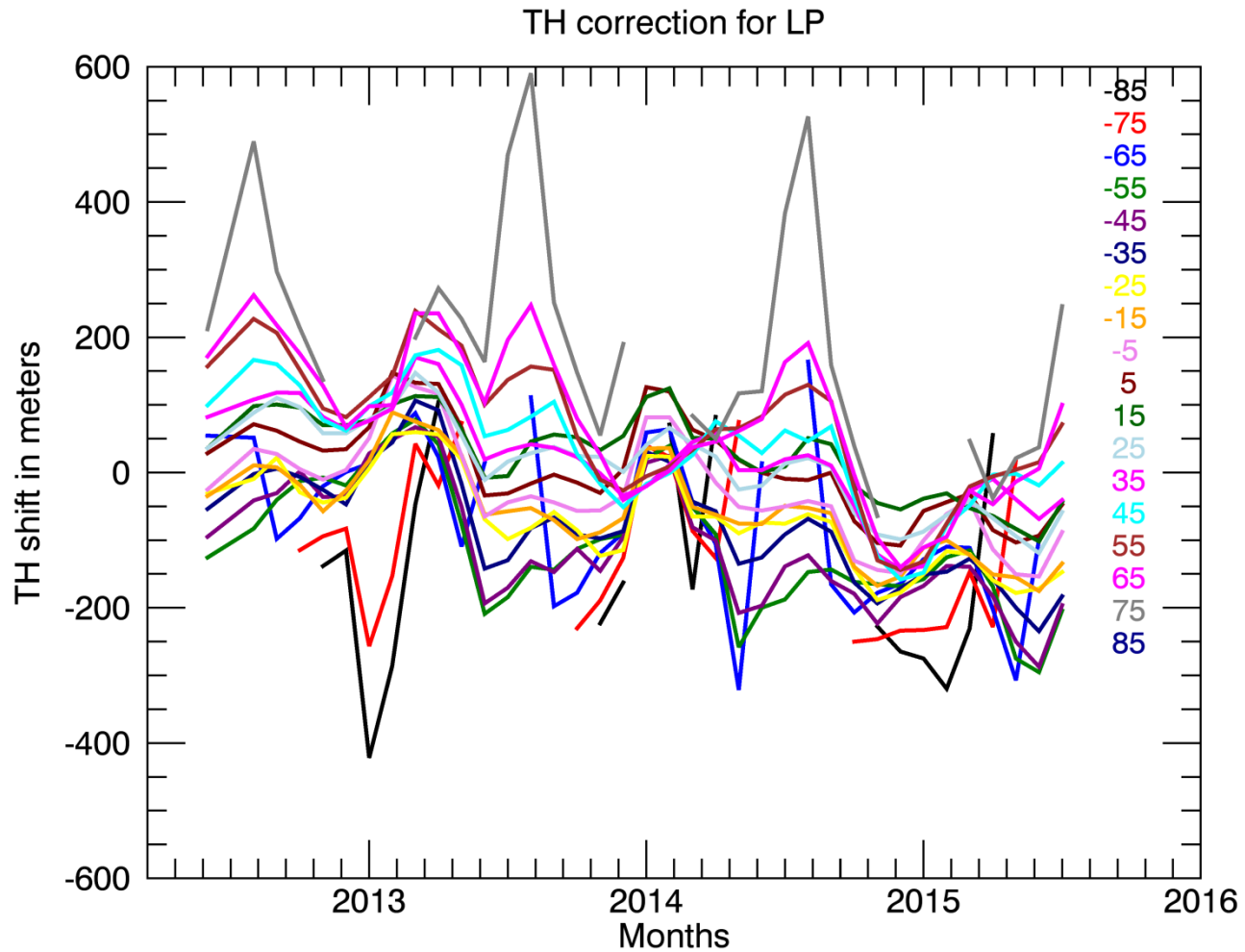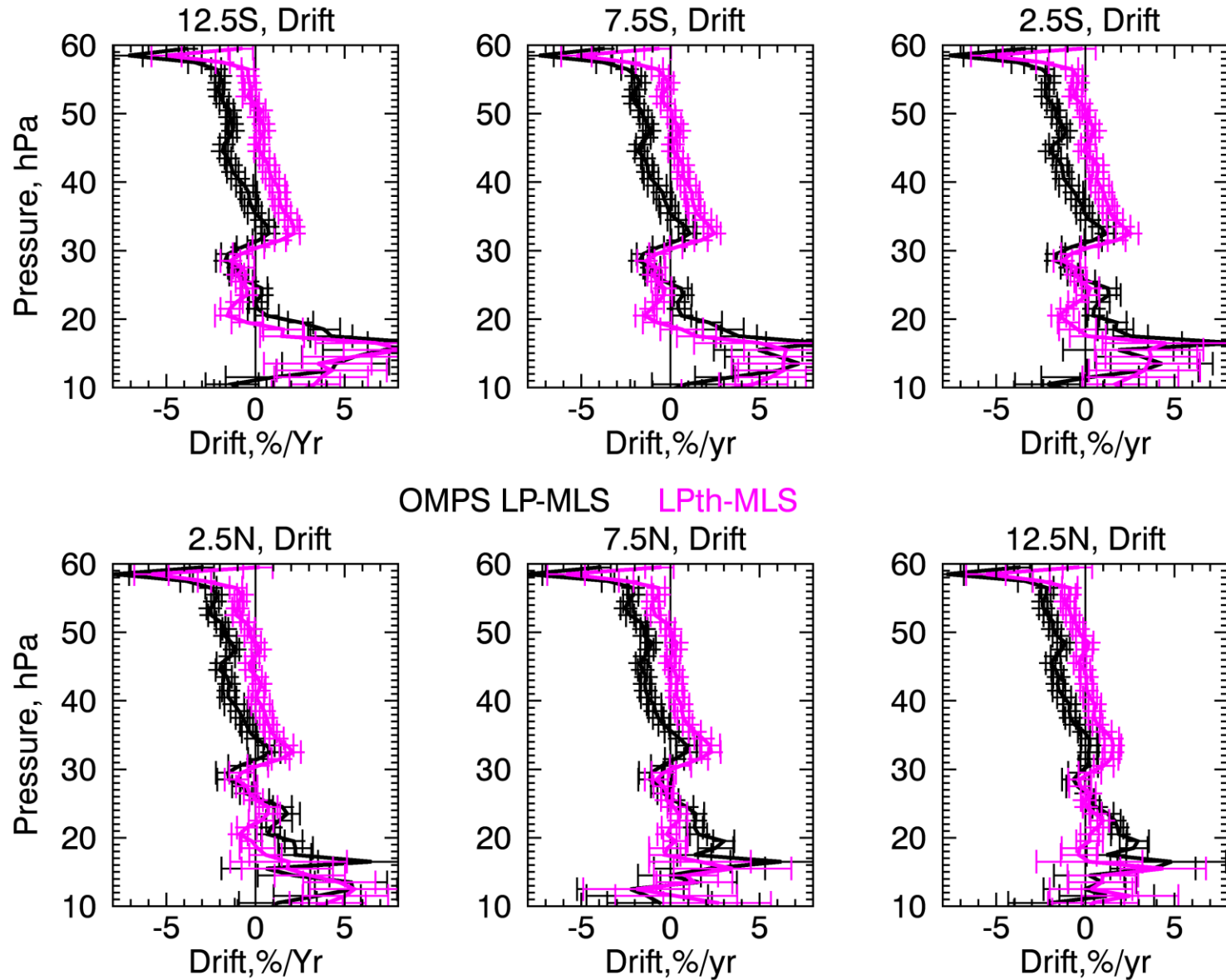# Does TH correction change the structure of LP-MLS biases over the entire 3-year period?
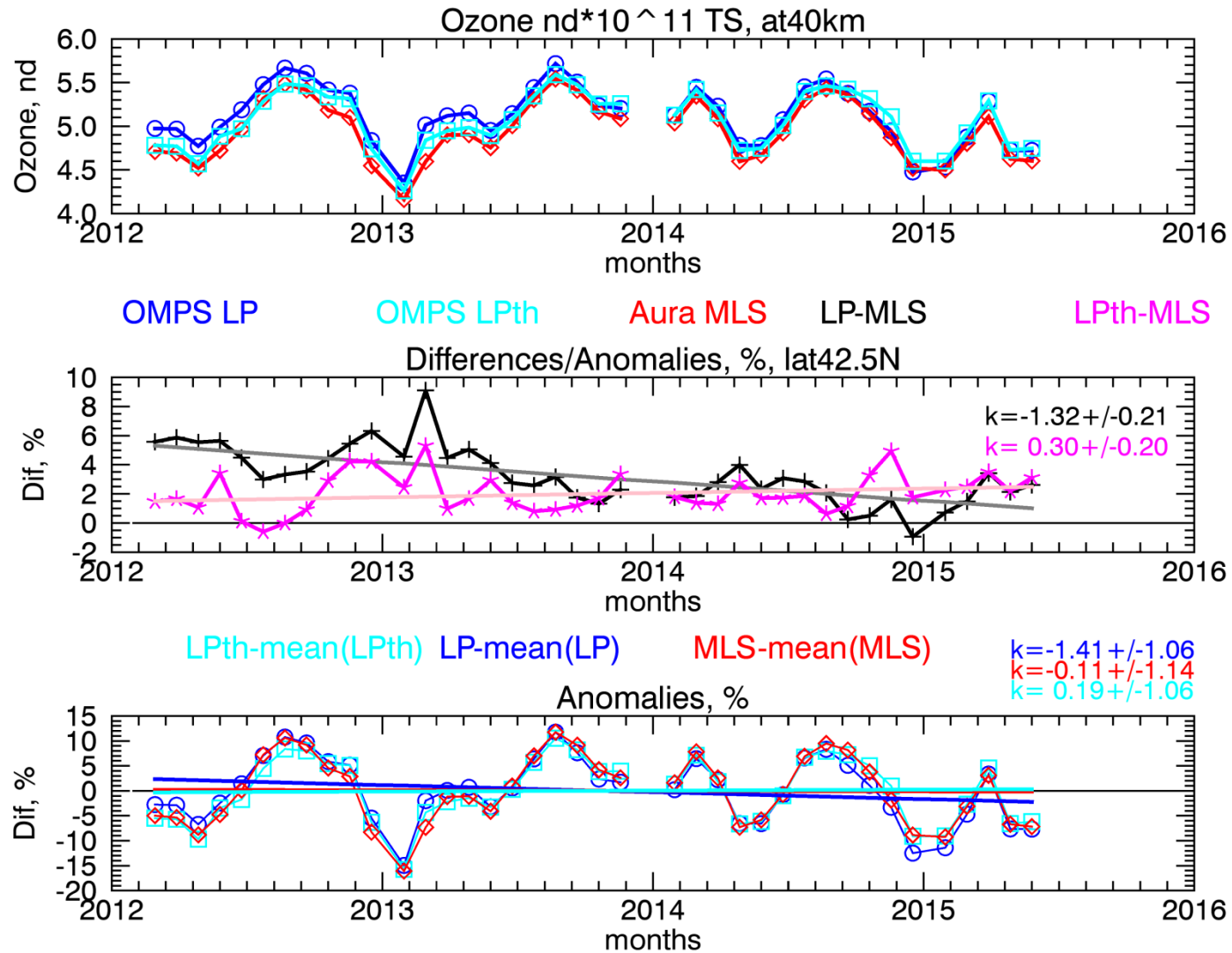
NH mid-latitudes

What next?

TH correction for LP

What next?

What next?

Ozone nd*10^11 TS, at40km

OMPS LP   OMPS LPth   Aura MLS   LP-MLS   LPth-MLS

Differences/Anomalies, %, lat42.5N

k=-1.32+/-0.21
k= 0.30+/-0.20

LPth-mean(LPth) LP-mean(LP)   MLS-mean(MLS)

k=-1.41+/-1.06
k=-0.11+/-1.14
k= 0.19+/-1.06

Anomalies, %

What next?